

- Consider the reaction of $\text{H}_2(\text{g})$ with $\text{I}_2(\text{g})$ at 298 K to give $\text{HI}(\text{g})$.



If partial pressures of 0.20 atm of all three gases are mixed, in which direction will the reaction proceed?

$$\text{The reaction quotient } Q = \frac{(p_{\text{HI}})^2}{(p_{\text{H}_2})(p_{\text{I}_2})} = \frac{(0.20)^2}{(0.20)(0.20)} = 1.0$$

As $Q < K_p$, the reaction will proceed towards HI, to increase the partial pressure of HI and decrease the partial pressure of H_2 and I_2 , until $Q = K$.

Answer: **towards products**

Calculate ΔG° for this reaction at 298 K.

Using $\Delta G^\circ = -RT \ln K_p$:

$$\Delta G^\circ = -(8.314) \times (298) \times \ln(2.24) = -2000 \text{ J mol}^{-1} = -2.00 \text{ kJ mol}^{-1}$$

Answer: **-2000 J mol⁻¹ = -2.00 kJ mol⁻¹**

Marks
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